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a result of these comparisons, it may be concluded that the hypoglossal nerve of the Sauropsida and Mammalia is not a separation from the anterior roots of the vagus, but is formed by the coalescence of a number — probably three — of anterior spinal nerves.

Since the completion of my manuscript, the last number of the *Archiv für anatomie und physiologie* has been received; and therein is a paper by Professor Froriep of Tübingen, dealing, among other things, with this very point as to the origin and morphological relations of the hypoglossal. His observations were carried on by means of sections through very young sheep and cow embryos; and he was able to perceive that the hypoglossal at an early stage consisted of three distinct parts, which eventually unite; the union occurring first near the origin of the nerve, and proceeding centrifugally. To emphasize the similarity between Froriep's results based on embryological data, and my own deduced from anatomical facts, it will be well to quote a sentence from his paper. In summing up, he says, "The hypoglossus is formed by the union of a number of segmental spinal nerves, each of which is composed of two roots, — a ventral and a dorsal, — exactly like spinal nerves."

J. PLAYFAIR McMURRICH.

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The Wisconsin bill relating to the instruction of deaf-mutes.

In *Science* (vol. v. p. 324) you state, that, until the present year, no special provision had been made in Wisconsin for the education of deaf-mutes. This is a mistake. The Wisconsin institution at Delavan, one of the best in the country, has been in successful operation since 1852, and two private schools are also in existence. The returns of the recent census, however, have shown that a large number of the deaf children of Wisconsin are growing up in ignorance, and that existing provisions for their instruction are inadequate. The bill that has just passed the Wisconsin legislature is an attempt to remedy the evil by a change in the policy of the state towards her deaf and dumb. The new plan may be tersely described as the policy of decentralization. The old policy of centralization — that is, the policy of collecting into one school all the deaf-mutes of a state — has everywhere failed to bring under instruction a large proportion of the deaf-mutes of school age. For example: there were in the United States in 1880, according to the last census, 15,059 deaf-mutes of school age (six to twenty years); while the total number of deaf-mutes returned as then in the institutions and schools of America was only 5,393, and many of these were beyond the school age. A similar result is obtained when we examine the statistics of each state taken separately.

Parents have a natural reluctance to part with their deaf children, who, more than others, require home care and attention. But education in an institution involves separation from home. Some parents will not part with their children excepting on compulsion; others delay the separation until the most impressionable period of life has been passed; and still others deprive their children of education on account of the value of their labor at home.

The nearer the school can be brought to the home of a deaf child, the less likelihood is there that he will escape instruction. The promoters of the Wisconsin bill believe that in many of the incorporated cities and villages of that state the deaf children

could, with limited state aid, be educated in the localities where they reside; and that, if day-schools were established wherever possible, the institution at Delavan would be able to accommodate all who could not attend a day-school.

The bill grants state aid to any incorporated city or village supporting a school for deaf-mutes, to the extent of a hundred dollars per annum for every pupil instructed. The state appropriation alone will probably be sufficient to provide a teacher for a school of four or five deaf children; but even a school containing only one deaf child, which, of course, would have to be supported mainly from local sources, may, by complying with the provisions of the bill, receive state aid to the amount of a hundred dollars per annum.

Under such a law, there should be no excuse for lack of instruction. Public opinion will probably compel the education of deaf-mutes: for, if allowed to grow up without instruction, they very easily become dangerous members of society; while, if educated, they become good citizens, amenable to the laws of society, and sources of wealth to the state. If only as a measure of economy, the Wisconsin bill demands consideration; for the average per capita cost of the education of a deaf child in an American institution exceeds two hundred and twenty-three dollars, whereas the cost to the state, on the Wisconsin plan, is limited to a hundred dollars.

But other considerations are of still greater importance. It certainly seems reasonable to expect that the Wisconsin plan, consisting of a central institution and a large number of small day-schools scattered throughout the state, will bring under instruction a larger percentage of the deaf children of school age than would be possible on the institution plan alone. Instruction can also be commenced in the day-schools at an earlier age than heretofore; so that many pupils could receive preparatory instruction in a day-school before entering the institution, and thus be enabled to receive from the institution a higher and better education than they could otherwise hope to obtain.

ALEXANDER GRAHAM BELL.

Washington, D.C., April 27.

A complete fibula in an adult living carinate-bird.

The only known bird with a complete fibula is the Jurassic Archaeopteryx (Marsh, Dames). The fibula of all birds is complete during the early life of the embryo. I find in an adult *Pandion carolinensis* of Prof. O. C. Marsh's collection an entire fibula, but with the distal end of it not in front of the tibia, as in *Archaeopteryx* (Marsh). It would be interesting to examine the embryos of this bird; and I will be very much obliged to anybody who can send me any of them.

DR. G. BAUR.

Yale-college museum, New Haven, Conn.,
April 24.

Digestion experiments.

I have read with some surprise the comments by Dr. E. Lewis Sturtevant in *Science*, April 24, upon my article on 'Errors in digestion experiments,' inasmuch as I had no intention, in that article, of asserting or implying any thing whatever in regard to other experiments of that character in this country. The purpose of the article was to call attention to the